NPScape
Monitoring Landscape Dynamics of Parks

National Park Service
U.S. Department of the Interior

Natural Resource Program Center
Inventory and Monitoring Division

Purpose

NPScape is a landscape dynamics monitoring project that produces and delivers to parks, a suite of landscape-scale data, maps, reports, and other products to inform natural resource management and planning at local, regional, and national scales.

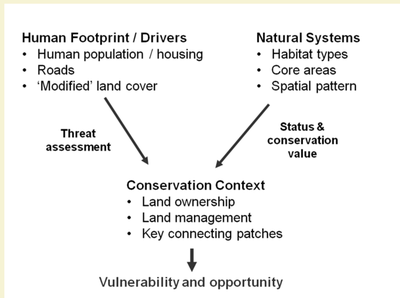
Changes in the composition and configuration of different land cover types within and adjacent to National Parks has been shown to greatly affect biological and physical processes within those parks, such as habitat availability, animal movements, potential for invasion by exotic plants, water quality, and in-stream habitat for fish and other aquatic organisms.

Information about changes and trends in landscape-scale indicators in and around parks can help park managers anticipate, plan for, and manage associated effects to park resources.

Conceptual Model

NPScape is designed to address questions related to resource conservation *Vulnerability and Opportunity*. These dynamics are shaped at the landscape scale by three major factors:

- Natural Systems
- Human Drivers
- Conservation Context



Measures

At its core, NPScape delivers a suite of products that focus on a set of information-rich, landscape-scale indicators for 270+ parks with significant natural resources. The analyses summarize and deliver measures in six major categories (population, housing, roads, land cover, pattern, and conservation status) that broadly address the environmental drivers, natural attributes, and conservation context of NPS units.

NPScape measures and source datasets are summarized in the table below.

Category	Measure	Years	Resolution	Coverage[a]
Population	Total	1990, 2000	Census block groups	National (2000) Lower 48, AK, HI (1990)
	Density	1990, 2000	Census block groups	National
	Recent Change in Total and Density	1990, 2000	Census block groups	National
	Historic Change by County	1790-2000, by decade	Varies	Lower 48
	Projected Change by County Percent total Density	2010-2030, by decade	Varies	Lower 48, AK
Housing	Current Density	2000	100 meter cells	Lower 48
	Recent Change in Density	1990, 2000	100 meter cells	Lower 48
	Historic Density	1940-1990, by decade	100 meter cells	Lower 48
	Projected Density	2010-2100, by decade	100 meter cells	Lower 48
Roads	Road Density Weighted All roads Major roads	Varies, but up to 2003, 2005	Varies	National & Canada
	Distance from Roads All roads Major roads	Varies, but up to 2003, 2005	Varies	National & Canada
	Area without Roads > 500 m from all roads > 500 m from major roads	Varies, but up to 2003, 2005	Varies	National & Canada
Land cover	Percent Natural vs. Converted	Varies, 1992-2006	30 & 250 meter cells	National, Canada & Mexico
	Change in Natural vs. Converted	Varies, 1992-2006	30 meter cells	Lower 48
	Area / Category	Varies, 1992-2006	30 & 250 meter cells	National, Canada & Mexico
	Percent Impervious	2001	30 meter cells	Lower 48, HI
Pattern	Grassland Morphology	2001, 2005	30 & 250 meter cells	Lower 48, AK, Canada & Mexico
	Forest Morphology	2001, 2005	30 & 250 meter cells	Lower 48, AK, Canada & Mexico
	Patch Size (grassland)	2001	30 meter cells	Lower 48
	Patch Size (forest)	2001	30 meter cells	Lower 48
	Grassland Density	2005	250 meter cells	Lower 48, AK, Canada & Mexico
	Forest Density	2005	250 meter cells	Lower 48, AK, Canada & Mexico
Conservation Status	Area Protected	Varies	Varies	National
	Ownership Area / Category	Varies	Varies	National
	Ownership	Varies	Varies	National

[a] National coverage includes all 50 states, plus Puerto Rico and US Virgin Islands, American Samoa, Northern Mariana Islands, and Guam.

About the author

Bill Monahan, Ecologist
Natural Resource Program Center
Inventory and Monitoring Division
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525
ph 970-267-2196
Bill_Monahan@nps.gov

For more information

Project website:

http://science.nature.nps.gov/im/monitor/npscape

Natural Resource Information Portal:

http://nrinfo.nps.gov

Products

NPScape products represent the culmination of a significant amount of data mining, processing, analysis, and summarization.

Existing products provided for each park and surrounding landscape include: GIS Data, Maps, Methods, GIS Scripts and Script Tools, and an Interpretive Guide.

Data

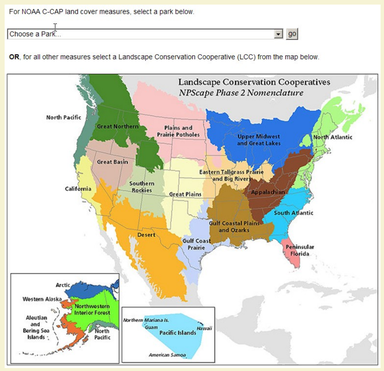
NPScape measures are produced at two relevant spatial extents:

(1) A local area within 30 kilometers (18.6 miles) of the park boundary, which captures landscape dynamics most proximate to parks

(2) At the scale of the Geographic Areas proposed by the Department of Interior for 21 Landscape Conservation Cooperatives (LCCs) to address landscape-scale climate change adaptation and conservation

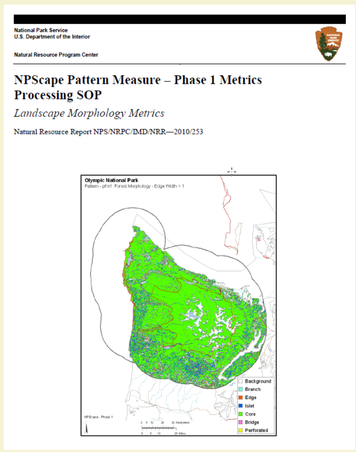
Where data permit, NPScape provides estimates of change in measures over time. Both the temporal and spatial resolutions of NPScape measures are determined by the availability of suitable data that encompass most parks.

Data can be downloaded as zip files from the NPScape website or directly from the NPS Natural Resource Information portal (NRInfo).



NPScape website GIS Data download interface.

Methods


National Park Service
U.S. Department of the Interior

Natural Resource Program Center

NPScape Pattern Measure – Phase 1 Metrics Processing SOP

Landscape Morphology Metrics

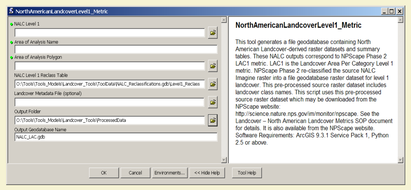
Natural Resource Report NPS/NRPC/IMD/NRR—2010/253

Standard Operating Procedures

NPScape methods are thoroughly documented in a series of Standard Operating Procedures (SOPs) for each of our measures. Each SOP documents the source data, any processing applied to source data as well as how to use the accompanying tools or scripts to generate customized outputs.

GIS Scripts and Script Tools

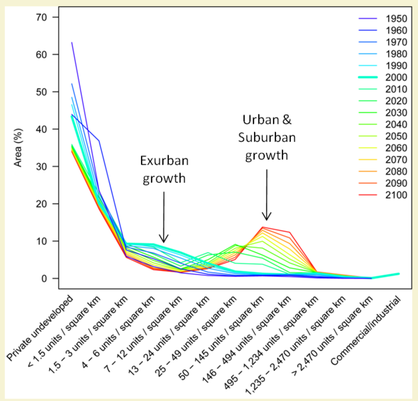
The GIS Python scripts and script tools accompanying the metric SOPs are also made available for quick and easy access. We provide these scripts and tools so that users can recompute NPScape measures for custom areas of analysis, like FWS refuges, or other source data.



North American Landcover Level1 Metric toolbox dialog window. The graphical interface allows a user to select options. Help documentation is included.

Guidance in Interpreting Results

The application of NPScape products to natural resource management and planning requires an understanding of the ecological theory and empirical research that enable science-based natural resource conservation. The NPScape *Interpretive Guide* serves as a primer for landscape ecology and provides parks with the basic information and examples they need to interpret resources in a landscape context.



An example analysis using NPScape data: past and future changes in housing density within the San Joaquin Valley air basin affecting Sequoia and Kings Canyon National Parks.

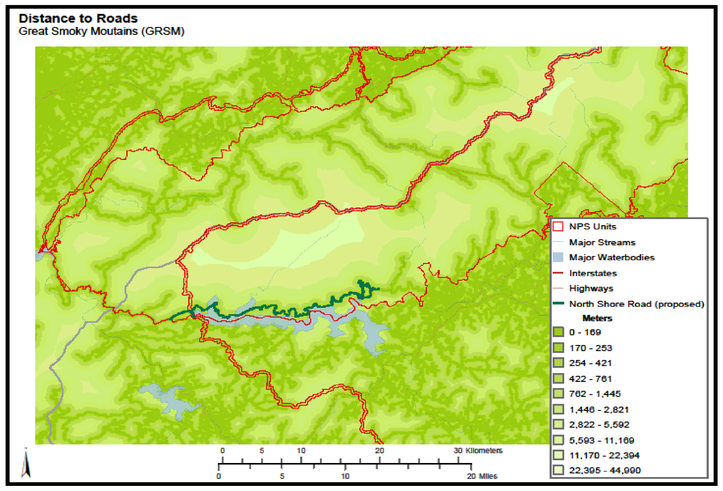
NPScape Application

Great Smoky Mountains National Park
North Shore Road—The Road to Nowhere

In 2010, the 67 year old controversy over building a 34 mile long road through pristine parkland was resolved. The result of an environmental impact study and negotiations to preserve land and provide financial compensation to the county means the road will not be built.

In 1943, the Tennessee Valley Authority (TVA) built Fontana Dam, flooding NC Rt. 288 and effectively cutting off access to residents of 44,000 acres of private land between the new Fontana Lake and the existing park boundary. Under a 1943 agreement, TVA purchased the 44,000 acres, which were added to the park, and the Department of the Interior originally agreed to build the road along the new north shore of the lake.

Using computed road metrics, the park was able to demonstrate the impact of the proposed route. The route would have compromised a significant roadless area within the park.



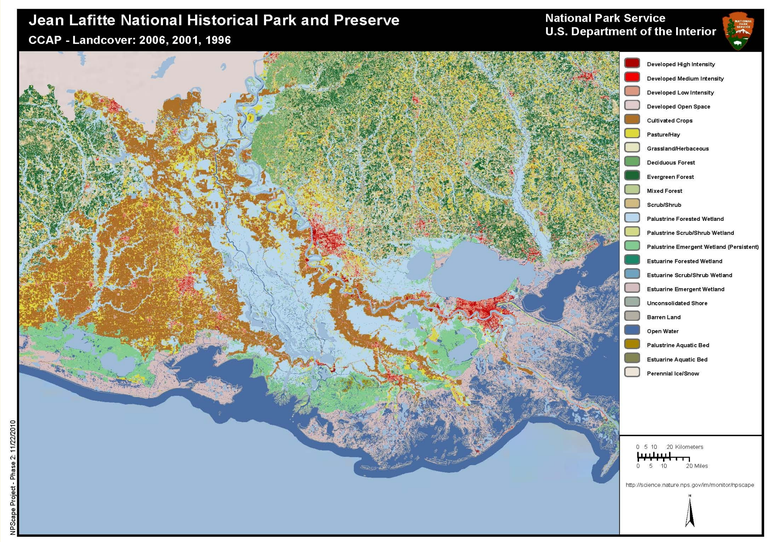
Map of the NPScape distance to road metric produced using the Road Metrics SOP after adding in the proposed road as a linear feature.

Maps

The NPScape map library is intended to make all of the GIS data and landscape measures more accessible to non-GIS audiences.

All maps provided in the map library are either geo-PDF (readable in Adobe Reader version 7 or higher) or KMZ (readable in Google Earth) and provide high-resolution zoomability, options to turn different features on or off, and the ability to identify geographic coordinates (latitude and longitude).

Maps are produced at the same spatial extents as the data—either local park with 30km buffer or at the LCC level.



Geo-enabled PDF map of Coastal Change Analysis Program (C-CAP) data for Jean Lafitte National Historical Park and Preserve. This map output includes layers for three years of data.